

IN THE CLAIMS

Please amend the claims as follows:

1 (Currently Amended): A method of embedding data in material, the method comprising the steps of:

producing transform coefficients  $[[Ci]] \underline{C}_i$  representing a transform of the material,  
and

combining the coefficients  $[[Ci]] \underline{C}_i$  with data symbols  $[[Ri]] \underline{R}_i$  to produce modified coefficients  $[[Ci']]\underline{C}_i'$  where

$$C_i' = C_i + \alpha_i R_i \quad \underline{C}_i' = \underline{C}_i + \alpha_i \underline{R}_i$$

the method further comprising determining an adaptation strength  $\alpha_i$   $[[\alpha_i]]$  for each unmodified coefficient  $[[Ci]] \underline{C}_i$  as a function  $F\{C_n\}_i$   $F\{C_n\}_i$  of a predetermined set  $\{C_n\}_i$   $\{C_n\}_i$  of transform coefficients  $[[Cn]] \underline{C}_n$  which set excludes the coefficient  $[[Ci]] \underline{C}_i$  wherein the coefficients are serially ordered and the coefficients  $[[Cn]] \underline{C}_n$  are coefficients preceding coefficient  $[[Ci]] \underline{C}_i$ .

2 (Currently Amended):  $[[A]]$  The method according to claim 1, wherein the coefficients the set  $\{C_n\}_i$   $\{C_n\}_i$  vary with i.

3 (Currently Amended):  $[[A]]$  The method according to claim 1, wherein the number  $[[Ni]] \underline{N}_i$  of coefficients in the set  $\{C_n\}_i$   $\{C_n\}_i$  varies with i.

4 (Currently Amended):  $[[A]]$  The method according to claim 1, wherein the coefficients of the set  $\{C_n\}_i$   $\{C_n\}_i$  have a predetermined positional relationship with the coefficient  $[[Ci]] \underline{C}_i$  to be modified.

5 (Currently Amended): [[A]] The method according to claim 1, wherein the coefficients represent a spatial frequency transform of the material.

6 (Currently Amended): [[A]] The method according to claim 1, wherein the coefficients represent a wavelet transform of the material.

7 (Currently Amended): [[A]] The method according to claim 6, wherein the transform produces coefficients [[Ci]] C<sub>i</sub> in a plurality of bands.

8 (Currently Amended): [[A]] The method according to claim 7, wherein the transform coefficients forming the set {C<sub>n</sub>}<sub>i</sub> {C<sub>n</sub>}<sub>i</sub> are all in the same band.

9 (Currently Amended): [[A]] The method according to claim 7, wherein the transform coefficients forming the set {C<sub>n</sub>}<sub>i</sub> {C<sub>n</sub>}<sub>i</sub> are in a plurality of bands.

10 (Currently Amended). [[A]] The method according to claim 1, wherein the said function F{C<sub>n</sub>}<sub>i</sub> F{C<sub>n</sub>}<sub>i</sub> is such that

$$\alpha_i = \frac{1}{N_i} \sqrt{\sum C_n^2} \text{ for } n = i-1 \text{ to } i-N_i \text{ for } N_i \neq 0 \text{ and } \alpha_i = k \text{ for } N_i = 0$$

$$\underline{\alpha_i} = \frac{1}{N_i} \sqrt{\sum C_n^2} \text{ for } n = i-1 \text{ to } i-N_i \text{ for } N_i \neq 0 \text{ and } \underline{\alpha_i} = k \text{ for } N_i = 0,$$

where [[Ni]] N<sub>i</sub> is the number of coefficients [[Cn]] C<sub>n</sub> in set i.

11 (Currently Amended): ~~[[A]]~~ The method according to claim 1, wherein the said data symbols ~~[[R<sub>i</sub>]]~~ R<sub>i</sub> are of a pseudo random symbol sequence having symbols ~~[[P<sub>i</sub>]]~~ P<sub>i</sub> modulated by data ~~[[W<sub>j</sub>]]~~ W<sub>j</sub> to be embedded.

12 (Currently Amended): ~~Apparatus~~ An apparatus for embedding data in material, comprising

a transformer for producing transform coefficients ~~[[C<sub>i</sub>]]~~ C<sub>i</sub> representing a transform of the material, and

a combiner for combining the coefficients ~~[[C<sub>i</sub>]]~~ C<sub>i</sub> with data symbols ~~[[R<sub>i</sub>]]~~ R<sub>i</sub> to produce modified coefficients ~~[[C<sub>i</sub>']]~~ C<sub>i</sub>' where

$$\cancel{C_i'} = \cancel{C_i} + \cancel{\alpha_i} \cancel{R_i} \quad \underline{C_i'} = C_i + \alpha_i R_i,$$

the apparatus further comprising

a calculator for calculating an adaptation strength ~~[[α<sub>i</sub>]]~~ α<sub>i</sub> for each unmodified coefficient ~~[[C<sub>i</sub>]]~~ C<sub>i</sub> as a function ~~F{C<sub>n</sub>}}~~ F{C<sub>n</sub>}} of a predetermined set ~~{C<sub>n</sub>}}~~ {C<sub>n</sub>}} of transform coefficients ~~[[C<sub>n</sub>]]~~ C<sub>n</sub> which set excludes the coefficient ~~[[C<sub>i</sub>]]~~ C<sub>i</sub>, wherein the coefficients are serially ordered and the coefficients ~~[[C<sub>n</sub>]]~~ C<sub>n</sub> are coefficients preceding coefficient ~~[[C<sub>i</sub>]]~~ C<sub>i</sub>.

13 (Currently Amended): The apparatus ~~Apparatus~~ according to claim 12, wherein the coefficients of the set ~~{C<sub>n</sub>}}~~ {C<sub>n</sub>}} vary with i.

14 (Currently Amended): The apparatus ~~Apparatus~~ according to claim 12, wherein the unmodified coefficients of the set ~~{C<sub>n</sub>}}~~ {C<sub>n</sub>}} have a predetermined positional relationship with the coefficient ~~[[C<sub>i</sub>]]~~ C<sub>i</sub> to be modified.

15 (Currently Amended): The apparatus ~~Apparatus~~ according to claim 12, wherein the coefficients represent a spatial frequency transform of the material.

16 (Currently Amended): The apparatus ~~Apparatus~~ according to claim 12, wherein the coefficients represent a wavelet transform of the material

17 (Currently Amended): The apparatus ~~Apparatus~~ according to claim 16, wherein the transformer produces coefficients  $[[C_i]]$   $C_i$  in a plurality of frequency bands.

18 (Currently Amended): The apparatus ~~Apparatus~~ according to claim 17, wherein the transform coefficients forming the set  $\{C_n\}_i$   $\{C_n\}_i$  are all in the same band.

19 (Currently Amended): The apparatus ~~Apparatus~~ according to claim 18, wherein the transform coefficients forming the set  $\{C_n\}_i$   $\{C_n\}_i$  are in a plurality of bands.

20 (Currently Amended): The apparatus ~~Apparatus~~ according to claim 12, wherein the said function  $F\{C_n\}_i$   $F\{C_n\}_i$  is such that

$$\alpha_i = \frac{1}{N_i} \cdot \sqrt{\sum C_n^2} \text{ for } n = i-1 \text{ to } i-N_i \text{ for } N_i \neq 0 \text{ and } \alpha_i = k \text{ for } N_i = 0$$

$$\alpha_i = \frac{1}{N_i} \cdot \sqrt{\sum C_n^2} \text{ for } n = i-1 \text{ to } i-N_i \text{ for } N_i \neq 0 \text{ and } \alpha_i = k \text{ for } N_i = 0,$$

where  $[[N_i]]$   $N_i$  is the number of coefficients  $[[C_n]]$   $C_n$  in set i.

21 (Currently Amended):  $[[A]]$  The method according to claim 1, wherein the data is imperceptibly embedded in the other material.

22 (Currently Amended):[[A]] The method according to claim 1, wherein the set  $\{C_n\}_i, \{C_n\}_i$  ~~consists of~~ includes unmodified coefficients.

23 (Currently Amended): The [[A]] method ~~or apparatus~~ according to claim 1, wherein the set  $\{C_n\}_i, \{C_n\}_i$  consists of modified coefficients preceding [[Ci]]  $C_i$  where the coefficients are serially ordered.

24 (Currently Amended): [[A]] The method ~~or apparatus~~ according to claim 1, wherein the set  $\{C_n\}_i, \{C_n\}_i$  comprises at least one modified coefficient and at least one unmodified coefficient.

25 (Currently Amended): A method of removing data embedded in material ~~according to the method of claim 1~~, the detecting method further comprising:

determining the values of the data symbols [[Ri]]  $R_i$ ;

calculating, for each modified coefficient [[Ci']]  $C_i'$ , the value of the said function  $F\{C_n\}_i, F\{C_n\}_i$  of the corresponding set  $\{C_n\}_i, \{C_n\}_i$  of coefficients [[Cn]]  $C_n$  to determine [[ $\alpha_i$ ]]  $\alpha_i$ ; and

for each modified coefficient [[Ci']]  $C_i'$ , subtracting therefrom  ~~$\alpha_i R_i - \alpha_i R_i$~~  to restore the unmodified coefficient value [[Ci]]  $C_i$ , wherein the coefficients are serially ordered and the said set  $\{C_n\}_i, \{C_n\}_i$  consists of modified coefficients preceding coefficient [[Ci]]  $C_i$ .

26 (Currently Amended): [[A]] The method according to claim 25, wherein the said set  $\{C_n\}_i, \{C_n\}_i$  ~~consists of~~ includes restored coefficients [[Ci]]  $C_i$  ~~and comprising the the~~

method further comprising a step of using a restored coefficient  $[[C_i]] \underline{C}_i$  as a coefficient of another set  $\{C_n\}_i, \{C_n\}_i$  of coefficients for restoring another coefficient  $[[C_j]] \underline{C}_j$ .

27 (Currently Amended): The  $[[A]]$  method according to claim 25, wherein the said set  $\{C_n\}_i, \{C_n\}_i$  comprises at least one modified coefficient and at least one restored coefficient, the coefficients preceding  $[[C_i']] \underline{C}_i'$ .

28 (Currently Amended):  $[[A]]$  The method according to claim 25, further comprising the step of determining the values of the data bits  $[[W_j]] \underline{W}_j$  embedded in material by correlating a reference pseudo random symbol sequence with the modified coefficients  $[[C_i']] \underline{C}_i'$  and decoding the correlation values to determine the data  $[[W_j]] \underline{W}_j$  modulating the pseudo random sequence and remodulating the reference sequence with the said data to restore  $[[R_i]] \underline{R}_i$ .

29 (Currently Amended): An apparatus ~~Apparatus~~ for removing data embedded in material ~~according to the method of claim 1~~, the apparatus comprising:

a processor for determining the values of the symbols  $[[R_i]] \underline{R}_i$ ;

a calculator for calculating, for each modified coefficient  $[[C_i']] \underline{C}_i'$ , the value of the said function  $F\{C_n\}_i, F\{C_n\}_i$  of the corresponding set  $\{C_n\}_i, \{C_n\}_i$  of coefficients  $[[C_n]] \underline{C}_n$  to determine  $[[\alpha_i]] \underline{\alpha}_i$ ; and

a subtractor which, for each modified coefficient  $[[C_i']] \underline{C}_i'$ , subtracts therefrom  ~~$\alpha_i \cdot R_i$~~   $\underline{\alpha}_i \cdot \underline{R}_i$  to restore the unmodified coefficient value  $[[C_i]] \underline{C}_i$ , which thereby becomes available for use as an unmodified coefficient of another set  $\{C_n\}_i, \{C_n\}_i$  of unmodified coefficients  $[[C_n]] \underline{C}_n$  for restoring another coefficient  $[[C_i']] \underline{C}_i'$ , wherein the coefficients are serially ordered and the said set  $\{C_n\}_i, \{C_n\}_i$  consists of coefficients preceding coefficient  $[[C_i]] \underline{C}_i$ .

30 (Currently Amended): ~~The apparatus~~ Apparatus according to claim 29, wherein the said set  $\{C_n\}_i, \{C_n\}_i$  consists of restored coefficients  $[[C_i]] \underline{C}_i$  and further comprising the ~~further step of means for~~ using a restored coefficient  $[[C_i]] \underline{C}_i$  as a coefficient of another set  $\{C_n\}_{i+1}, \{C_n\}_{i+1}$  of coefficients for restoring another coefficient  $C_{i+1} \underline{C}_{i+1}$ .

31 (Currently Amended): ~~The apparatus~~ Apparatus according to claim 30, wherein the said set  $\{C_n\}_i, \{C_n\}_i$  ~~consists of~~ includes modified coefficients preceding coefficient  $[[C_i]] \underline{C}_i$ .

32 (Currently Amended): ~~The apparatus~~ Apparatus according to claim 30, wherein the said set  $\{C_n\}_i, \{C_n\}_i$  comprises at least one modified coefficient and at least one restored coefficient, the coefficients preceding  $[[C_i']] \underline{C}_i$ .

33 (Currently Amended): ~~The apparatus~~ Apparatus according to claim 29, further ~~comprising~~ comprising means for determining the values of the data bits  $[[W_j]] \underline{W}_i$  embedded in the material, said means for determining comprising a correlator for correlating a reference pseudo random symbol sequence with the modified coefficients  $[[C_i']] \underline{C}_i$ , a decoder for decoding the correlations to determine the data  $[[W_j]] \underline{W}_i$  modulating the modulated sequence and a modulator for remodulating the reference sequence with the said data to restore  $[[R_i]] \underline{R}_i$ .

34 (Previously Presented): A computer program product arranged to carry out the method of claim 1 when run on a computer.

35 (Currently Amended): A computer program product arranged to carry out the method of claim 25 when run on a computer.

36 (Currently Amended): The ~~[[A]] method or apparatus~~ according to claim 1, wherein the material is video material.

37 (Currently Amended): The ~~[[A]] method or apparatus~~ according to claim 1, wherein the material is audio material.

38 (Currently Amended): The ~~[[A]] method or apparatus~~ according to claim 1, wherein the material is audio/visual material.

39-58 (Cancelled).

59 (Currently Amended): The Apparatus apparatus according to claim 12, wherein the data is imperceptibly embedded in the other material.

60 (Currently Amended): The Apparatus apparatus according to claim 12, wherein the set  ~~$\{C_n\}$~~   $\{C_n\}$  consists of unmodified coefficients.

61 (Currently Amended): The Apparatus apparatus according to claim 12, wherein the set  ~~$\{C_n\}$~~   $\{C_n\}$  ~~consists of~~ includes unmodified coefficients.



62 (Currently Amended): ~~The Apparatus~~ apparatus according to claim 12, wherein the set  $\{C_n\}_{i=1}^n$  comprises at least one modified coefficient and at least one unmodified coefficient.